

requires the rotation of the control body. In contrast, the brewing head of the present invention only moves the upper member, i.e., the rotate to lock assembly. The lower member, i.e., the support base of the brewing head of the present invention is fixed, but the filter holder assembly containing the filter can be removed completely for cleaning. Furthermore, the Domel et al device is only designed for coffee bags. The present invention is designed to use both ground coffee and coffee bag.

10 Torriani, U.S. Patent No. 1,750,068, relates to a device containing a circular filter-carrier adapted to slide in and out of a window. The filter-carrier is locked by rotating a collector below the filter-carrier to force the filter-carrier upward against the upper portion of the brew head. The device in Torriani patent has the design of a traditional espresso machine. The filter carrier can slide in and out, but to lock the filter carrier still requires blindly turning the thread on the collector.

20 Hatz, U.S. Patent No. 811,979, relates to a device for preparing coffee, which includes a pressure cooker for forcing heated water to the coffee percolator by stream pressure. The Hatz device uses a different method to prepare the coffee. Hatz uses a pressure cooker instead of a boiler system. Hatz also uses a preculator instead of the filter holder. The pressure cooker requires a stove or heating device to heat up the water. The coffee machine of the present invention uses electricity to bring the water to boil.

30 The foregoing objects and advantages of the present invention are illustrative of those that can be achieved by the present invention and are not intended to be exhaustive or limiting of the possible advantages which can be realized. Thus, these and other objects and advantages of the invention will be apparent from the description herein or can be learned from practicing the invention, both as embodied herein or as modified in view of any variation which may be apparent to those skilled in the art. Accordingly, the present invention resides

The accompanying drawing illustrates diagrammatically non-limitative embodiment of the invention as follows:

- 5 One embodiment of this invention, hereinafter referred to as Construction I, is shown in Figure 1 to Figure 5.

10 **Figure 1** is a cross-sectional illustration of the brewing head assembly or unit of Construction I in the closed position. A: Top view. B: Side view.

**Figure 2** is a cross-sectional illustration of the brewing head assembly or unit of Construction I in the opened position.

- 15 **Figure 3** is an exploded view of the brewing head assembly or unit of Construction I, comprising a rotate to lock assembly, a sealing assembly, a slide filter holder assembly, a separated boiler and a hose for delivering pressurized and/or heated water/steam from the boiler to the coffee chamber.

20 **Figure 4** is isometric view of the brewing head assembly or unit of Construction I in the opened position.

25 **Figure 5** is isometric view of the brewing head assembly or unit of Construction I in the closed position.

Another embodiment of this invention, hereinafter referred to as Construction II, is shown in Figure 6 to Figure 10.

- 30 **Figure 6** is a cross-sectional illustration of the brewing head assembly or unit of Construction II in the closed position. A: Top view. B: Side view.

35 **Figure 7** is a cross-sectional illustration of the brewing head assembly or unit of Construction II in the opened position. A: Top view. B:

Figure 8 is an exploded view of the brewing head assembly or unit of Construction II, comprising a rotate to lock assembly, a sealing assembly, a slide filter holder assembly, a separated boiler and a hose for delivering pressurized and/or heated water/steam from the boiler to the coffee chamber.

Figure 9 is isometric view of the brewing head assembly or unit of Construction II in the opened position.

Figure 10 is isometric view of the brewing head assembly or unit of Construction II in the closed position.

Another embodiment of this invention, hereinafter referred to as Construction III, is shown in Figure 11 to Figure 16.

Figure 11 is a cross-sectional illustration of the brewing head assembly or unit of construction III in the closed position. A: Top View. B: Side View.

Figure 12 is a cross-sectional illustration of the brewing head assembly or unit of construction III in the opened position. A: Top View. B: Side View.

Figure 13 is a exploded view of the brewing head assembly or unit of construction III, comprising a rotate to lock assembly, a sealing assembly, a slide filter holder assembly, a separated boiler and hose for delivering pressurized and/or heater water/steam from the boiler to the coffee chamber.

Figure 14 is isometric view of the brewing head assembly or unit of construction III in an opened position showing the filter holder slide into the brewing head assembly or unit of construction.

Figure 15 is isometric view of the brewing head assembly or unit of construction III in the closed position.

Figure 16 is a cross-sectional illustration of the brewing assembly or unit of construction III in closed position. The section view shows the stopper on the rotation pole to keep the moving rod stopped on the inter lock position. A: Top View. B: Side View.

#### DETAILED DESCRIPTION OF THE INVENTION

It is the object of this invention to provide a cabinet design of the filter holder. This invention provides a boiler or heating system which is separate from the brewing head unit of the coffee machine and a locking mechanism.

This invention provides a locking mechanism which is advantageous over prior art in that the filter holder unit does not need to be turned for it to lock. We only need slide in the filter holder and rotate down the handle. It is easier to operate and more efficient than the traditional turning lock mechanism.

#### I. Rotate to Lock Assembly of Construction I

This invention provides a brewing head assembly or unit (See Figure 1-5) of a coffee maker comprising: a rotate to lock assembly, a sealing assembly and a filter holder assembly or unit, operatively linked to sustain pressure of at least 5 bars. In an embodiment, the above-described rotate to lock assembly, sealing assembly, and filter holder assembly or unit are operatively linked and are capable of sustaining advantageously at least 10 bars of pressure. In another embodiment, the above-described rotate to lock assembly, sealing assembly, and filter holder assembly or unit are operatively linked and are capable of sustaining advantageously at least 15 bars of pressure. In a further embodiment, the above-described rotate to lock assembly, sealing assembly, and filter holder assembly or unit are operatively

This invention provides a rotate to lock assembly comprising handle 12 movably joined to a rotate plate 11, a rotate rod 10 and a top frame 1 by a fixed pin 13, at a position as indicated by arrow D in Figure 4. A back connection plate 8 is fixed on one end to the top frame, at the positions as indicated by arrows B and D in Figure 4, and movably joined to a support base 14 on another end, at a position as indicated by arrow A in Figure 4. A front connection plate 9 is moveably joined to rotate plate on one end, at a position as indicated by arrow C in Figure 4, and to the support base 14 on another end, at a position as indicated by arrow E. In an embodiment, the rotate to lock assembly is as shown in Figure 3.

This invention provides a sealing assembly comprising a seal ring 4, which is inserted between a water connection plate 2 and a water spreader 6. A water outlet valve 3, which contains a water outlet spring 5, is inserted through the center of the water spreader 6, seal ring 4, and the water connection plate 2. The water outlet valve 3, the water outlet spring 5, the seal ring 4, the water spreader 6 are fixedly attached to the water connection plate 2 by a water outlet valve holder 7. The water connection plate is fixedly attached to the top frame. The water connection plate 2 contains an opening 31 for connecting the water connection plate 2 to a hose 20 for delivering heated and/or pressurized fluid from a boiler 19 through the sealing assembly to the brewing chamber. In an embodiment, the sealing assembly is as shown in Figure 3.

The water outlet valve holder 7 is the nut which holds the water spreader 6, water outlet spring 5, seal ring 4, and the water outlet valve 3 to the water connection plate 2.

This invention provides a filter holder assembly/unit comprising a filter 15, filter handle 16, filter holder 17 and coffee chamber 18.

3.

5 The operations of the locking mechanism of an embodiment of the present invention, i.e., Construction I, are as follows:

10 To prevent the leakage of water, the silicone rubber seal ring is used on the brew head to form a water- and/or pressure-tight connection between the water connection plate 2 and the filter 15. The silicone rubber seal ring 4 is fixed between the water connection plate 2 and water spreader 6 by the water outlet valve holder 7.

15 To unlock the cabinet filter holder 17, the handle 12 rotates upward in the direction of arrow X, the rotate rod 10 and the rotate plate 11, which are operatively linked, move from the upright position backwards to an inclined position. The opening angle of the brew head is about 45 to 55 degrees. After opening the brewing head assembly or unit, the filter holder can be slide into the support base 14 in the direction of arrow Y, or pulled out of the support base 14.

20 To close and/or lock the brewing head assembly or unit, the handle is moved downward. The rotate pin, rotate plate 11 and front connection plate 9 moves upright, and the brew head is locked. Once locked, the silicone rubber seal ring 4 sits on the filter 15. The water connection plate 2 in the locked position will make the seal ring 4 deform on the filter 15. This deformation creates a seals to prevent water from leaking from the flange of the filter 15.

30 The upright position of the rotate plate 11, rotate pin and the front connection plate 9 can sustain at least 20 bars of pressure exerted on the filter 15 so it will not leak when at least 20 bars of pressure is applied. In the closed position, the coffee machine can start to brew coffee.

35 Figure 3 shows the exploded view of one aspect, i.e., Construction

This invention provides a brewing head assembly or unit, i.e., See Figure 6-10, of a coffee maker comprising: a rotate to lock assembly, a sealing assembly and filter holder assembly, operatively linked to sustain pressure of at least 5 bars. In an embodiment, the  
5 above-described rotate to lock assembly, sealing assembly, and filter holder assembly are operatively linked, and are capable of sustaining advantageously at least 10 bars of pressure. In another embodiment, the above-described rotate to lock assembly, sealing assembly, and filter holder assembly are operatively linked and are capable of  
10 sustaining advantageously at least 15 bars of pressure. In a further embodiment, the above-described rotate to lock assembly, sealing assembly, and filter holder assembly are operatively linked and are capable of sustaining advantageously at least 20 bars of pressure.

15 This invention provides a rotate to lock assembly, comprising a handle, a top frame, a connecting plate, a hinge pin, a cam pin and a support base. In an embodiment, the rotate to lock assembly is as shown in Figure 8.

20 This invention provides a sealing assembly, comprising a seal ring, a water connection plate, a water outlet valve, a water outlet spring, a water spreader, and a water outlet valve holder. In an embodiment, the sealing assembly is as shown in Figure 8.

25 This invention provides a filter holder assembly or unit, comprising a filter, a filter handle, a filter holder and a coffee chamber. In an embodiment, the filter holder assembly or unit is as shown in Figure 8.

30 The operation of the locking mechanism of an embodiment of the present invention, i.e., Construction II, is as follows:

To prevent the leakage of water from the brewing head, a silicone rubber seal ring 4 is used on the brewing head unit. The silicone  
35 rubber seal 4 is fixed between a water connection plate 2 and a water

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spreader 6 by a water outlet valve holder 7. See Figure 8.

To operate the rotate to lock assembly, a handle 12 is rotated upwards in the direction of arrow W until the handle 12 is 90 degrees with the horizontal. See Figure 9. A cam pin 8.11 is linked to the handle 12, at a position as indicated by arrow H in Figure 9. When the cam pin 8.11 rotates, it causes the connection plate 8.3 to rise up in the direction of arrow U. The connection plate 8.3 is linked to the top frame 8.1 by two hinge pins 8.2 on both side, at the positions as indicated by arrows I and K. The clamp force on the filter holder 17 is released by lifting the connection plate 8.3 with the cam pin 8.11 and handle 12. Once the brewing head assembly or unit is in the opened position, the user can insert or slide-in the filter holder assembly or unit in the direction of arrow V, or pull out the filter holder assembly or unit. See Figure 9.

To brew coffee, the filter holder assembly or unit is inserted into the cabinet filter holder housing located on the support base 8.12 of the brewing head assembly or unit. Then the handle 12 is rotated downward to the locked or closed position. See Figure 10. The cam pin 8.11 will force the connection plate 8.3 downward. The connection plate 8.3 and cam pin 8.11 configuration will create a clamp force capable of maintaining pressure- and/or water-tight seal up to at least 20 bars against the filter holder assembly. The filter holder is sealed by a seal ring 4 and with the clamp force created by the cam pin 8.11 and the connection plate 8.3.

Figure 8 is the exploded view of the brewing head assembly or unit of Construction II showing the components of the rotate to lock assembly, the sealing assembly and the filter holder assembly.

As shown in Figure 8, the metal handle 12 rotates upward to unlock the brewing head unit. The handle is linked to cam pin 8.11 and the connection plate 8.3 by a screw. When the handle moves, the cam pin 8.11 will rotate. The irregular shape of the cam pin will cause the



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connection plate 8.3 to rise up because the connection plate 8.3 is connected to the top frame 8.1 by the hinge pin 8.2 on both sides. The connection plate will also cause the top frame 8.1 to rise up slightly. The inclination angle between the top frame 8.1 and the support base 8.12 is about 10 degrees. This angle is just enough for the filter holder assembly or unit to slide in and out of the brewing head unit. After the filter holder assembly or unit is inserted into the brewing head unit, the handle can be rotated downward to lock the filter holder assembly or unit.

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The sealing assembly of the brew head assembly or unit of Construction II is composed of a top frame 8.1, a water connection plate 2, a seal ring 4, a water outlet valve 3, a water outlet spring 5, a water spreader 6 and a water outlet valve holder 7. The water outlet valve holder 7 is the nut which holds the water spreader 6, water outlet spring 5, seal ring 4, and water outlet valve 3 to the water connection plate 2. The sealing assembly is fixed to the top frame 8.1 by one or more screw. Water outlet valve 3 and water outlet spring 5 is used to prevent water leakage from the water spreader 6 under low pressure during the water heating stage. Hot water is released when the pump pressure is greater than the force exerted by the water outlet spring 5, which is around 5 Bar. When the hot water makes contact with the coffee, the pump pressure will increase to at least 10 to 20 bars. Then the coffee will flow out to the cup.

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To brew coffee, the user needs to slide the filter holder assembly or unit into the brewing head assembly or unit. The filter holder assembly or unit is comprised of a filter 15, a filter handle 16, filter holder 17 and the coffee chamber 18. The coffee is placed on the filter 15, and then the filter 15 is inserted into the filter holder 17. The coffee chamber 18 collects and releases the brewed coffee.

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In another aspect of the invention, a motor is operatively linked to the rotate plate, rotate rod and front connection plate of

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Construction I or cam pin and connection plate of Construction II.

The motor, which duplicates the functions performed by the handle, can be adapted by one of ordinary skill in the art to rotate the rotate plate and rotate rod to of the front connection plate of Construction I or the cam pin of Construction II to lock or unlock the brewing head assembly. A set of gears may be connected to the cabinet filter holder unit and the motor so that the movement of the cabinet filter holder is made automatic without manual intervention. In an embodiment, a button is pressed to open the rotate and lock assembly to allow the user to place the filter with coffee into the cabinet filter holder assembly or unit. The user then press a button to operate the motor used to slide in the cabinet and close the lock and/or the brewing head unit. In another aspect of the invention, the motor can be operated by remote control.

### III. Rotate to Lock Assembly of Construction III

This invention provides a brewing head assembly or unit, as illustrated in Figures 11-16, of a coffee maker comprising: a rotate to lock assembly, a sealing assembly and a filter holder assembly or unit, operatively linked to sustain pressure of at least 5 bars. In an embodiment, the above-described rotate to lock assembly, a sealing assembly and a filter holder assembly or unit, operatively linked to sustain pressure of at least 10 bars. In an embodiment, the above-described rotate to lock assembly, a sealing assembly and a filter holder assembly or unit, operatively linked to sustain pressure of at least 15 bars. In further embodiment, the above-described rotate to lock assembly, a sealing assembly and a filter holder assembly or unit, operatively linked to sustain pressure of at least 20 bars of pressure.

This invention provides a rotate to lock assembly, comprising a handle 12, a rotation pole 13.20 having a protruding member 20A, a moving rod 22, a support base 13.17 having two protruding members 17A, a copper shaft 23, a slider plate 13.1 having upper protruding member 1A and lower protruding member 1B, a slider plate holder 13.15, a

shower head 13.14 and four brushing short 13.3. The handle 12 and the rotation pole 13.20 are moveably joined to the protruding member 17A of the support base 13.17, at a position as indicated by arrow A in Figure 14. One end of the moving rod 22 is moveably joined to the protruding member 20A of the rotation pole 13.20 by a copper shaft 23, at a position as indicated by arrow B in Figure 14, and the other end of the moving rod 22 is movably joined to the upper protruding member 1A of the slider plate 13.1, at a position as indicated by arrow C in Figure 14. The slider plate 13.1 is guided by the slider plate holder 13.15 with four brushing short 13.3, which are moveably joined to the upper and lower protruding member 1A and 1B, respectively, at a position as indicated by arrow D in Figure 14. The slider plate holder 13.15 is attached to the support base 13.17. The shower head 13.4 is attached to the bottom of the slider plate 13.1. In an embodiment, the rotate to lock assembly is as shown in Figure 13.

This invention provide a sealing assembly comprising a seal ring 24, when is installed on to the shower head 13.4. A water spreader 6 is fixedly attached to shower head 13.4 by spreader holder 13.6. In an embodiment, the seal ring is fabricated from silicon rubber, or elastomeric or other suitable material capable of providing water-tight and/or pressure-tight seal under pressure and/or elevated temperature. Suitable materials which can be used to fabricate the seal ring are readily determinable by one of ordinary skill in the art. In another embodiment, the sealing assembly is as shown in Figure 13.

This invention provides a filter holder assembly or unit, comprising a filter 13.7, filter basket 13.8 and a filter handle 13.10. In an embodiment the filter is fabricated from metal, plastic or other suitable material. Suitable materials which can be used to fabricate the filter are readily determinable by one of ordinary skill in the art. In another embodiment, the filter holder assembly or unit is as shown in Figure 13.

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The operation of the locking mechanism of an embodiment of the present invention, i.e., Construction III, is as follows:

To prevent the leakage of the water from the brewing head, a silicone rubber seal ring 24 is used on the brewing head assembly or unit. The silicone rubber sealing ring 24 is fixed onto the shower head 13.4. See Figure 13.

To operate the rotate to lock assembly, a handle 12 is rotated upwards in the direction of arrow E, as shown in Figure 14, until the metal handle 12 is approximate 100 degrees with the horizontal. See Figure 14. A rotation pole 13.20 is moveably linked to each side of the handle 12 at a position as indicated by arrow A in Figure 14. When the rotation pole 13.20 rotates, it causes the moving rod 22 to swing up in the direction of arrow F, as shown in Figure 14. The upward movement of the moving rod 22 causes the slider plate 13.1 to move upward, as indicated by arrow G in Figure 14. The shower head 13.4, which is attached to the bottom of the slider plate 13.1 also moves upward with the slider plate 13.1. See Figure 14. The clamp force on the filter holder 13.11 is released by lifting the shower head 13.4 with the rotation pole 13.20 and the handle 12. Once the brewing head assembly or unit is in the opened position, the user can insert or slide-in the cabinet filter holder assembly or unit in the direction of arrow H, as shown in Figure 14, or pull out the filter holder assembly or unit. See Figure 14.

To brew coffee, the cabinet filter holder 13.11 is inserted into the support base 13.17 of filter holder assembly or unit. The cabinet filter holder 13.11 is supported by a filter holder support plate 13.18 attached to the bottom of the support base 13.17. The cabinet filter holder 13.11 can also be supported by guides located on either side of the cabinet filter holder 13.11, i.e., see 11A, and corresponding recesses or protrusions located on the support base 13.17. Then the handle 12 is rotated downward in the direction of arrow K, as shown in Figure 15, until the handle is 0 degree or parallel with the horizontal

to make the moving rod 22 stop at a pre-selected position, for example  
 to stop or hold the handle 12 at about parallel to the horizontal.  
 See Figure 15 and 16. The downward movement of the handle 12 causes  
 5 the rotation pole 13.20 and the moving rod 22 to swing or move downward.  
 And causes the slider plate and the sealing assembly or unit to also  
 move downward and lower into the filter basket 13.8. See Figure 15.  
 Once the sealing assembly or unit is lowered into the filter basket  
 13.8, the compression force exerted on the sealing ring 24 by the  
 10 shower head 13.4 through the rotate to lock assembly on the filter  
 basket 13.8 will form water- and/or pressure-tight seal between the  
 filter basket 13.8 and the shower head 13.4. In an embodiment, the  
 sealing ring can seal up to at least 20 bars. During the brewing cycle,  
 15 the hot water and/or steam is released from the boiler 13.19 and/or  
 heating system when the pump is turn on. The steam and/or hot water  
 are delivered into the area between the shower head 13.4 and the filter  
 basket 13.8 by a suitable tube. The pressure, i.e., from the pump,  
 will make the shower head move upward in the direction of arrow L,  
 as shown in Figure 16B, which also causes the moving rod swing upward  
 20 in the direction of arrow M, as shown in Figure 16B. The stopper 20B,  
 as shown in Figure 16B, on the rotation pole will prevent the moving  
 rod 22 from swinging upward completely. The stopper 20B ensures that  
 the inter-locking force on the shower head 13.4 is maintained so that  
 the sealing assembly or unit can not be un-lock.

25 To brew coffee, the user needs to slide the filter holder assembly  
 or unit into the brewing head assembly or unit. The filter holder  
 assembly or unit is comprised of a filter 13.7, a filter basket 13.8,  
 filter handle 13.10, a foam system 13.9 and a cabinet filter holder  
 30 13.11. The coffee is placed on the filter basket 13.8, and then the  
 filter is inserted into the cabinet filter holder 13.11. The filter  
 holder collects and releases the brewed coffee.

In another aspect of the invention, a motor is operatively linked  
 35 to the rotation pole 13.20 of the brewing head of Construction III.

The motor, which duplicates the functions performed by the handle, can be adapted by one of the ordinary skill in the art to rotate the rotation pole 13.20 of the brewing head of Construction III to lock or un-lock the brewing head assembly. A set of gears may be connected to the cabinet filter holder assembly or unit and the motor so that the movement of the cabinet filter holder assembly or unit is made automatic without manual intervention. In an embodiment, a button is pressed to open the rotate to lock assembly to allow the user to place the filter 13.7 with coffee into the cabinet filter holder assembly or unit. The user then press a button to operate the motor used to slide in the cabinet filter holder and close the lock and/or the brewing head unit. In another aspect of the invention, the motor can be operated by a remote control.

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